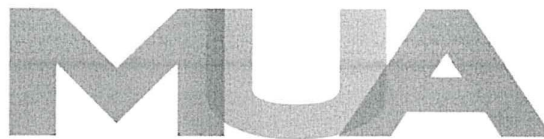


MUA/RASA/EXAM/QP/2014

The  
Management  
University  
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**UNDERGRADUATE UNIVERSITY EXAMINATIONS**

**SCHOOL OF MANAGEMENT AND LEADERSHIP**

**DEGREE OF BACHELOR OF MANAGEMENT AND LEADERSHIP/  
BACHELOR OF COMMERCE**

**BML 103/ BCM 112: BUSINESS MATHEMATICS**

**DATE: 13<sup>TH</sup>, AUGUST 2014**

**DURATION: 2 HOURS**

**MAXIMUM MARKS: 70**

**INSTRUCTIONS:**

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **six (6)** questions.
4. Question **ONE** is compulsory .
5. Answer any other **THREE** questions.
6. Question one carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

**QUESTION ONE**

- a) Explain the difference between the following terms:
- Sub sets versus overlapping sets
  - Census versus Sampling (6 marks)
  - Independent versus mutually exclusive events
- b) What is implied about sets A and B if  $n(A \cup B) = n(B)$  (2 marks)
- c) Find  $\frac{dy}{dx}$  if  $y = \frac{1}{x^2} + (x-1)(2x-3)$  (3 marks)

- d) i) Given the matrices

$$P = \begin{bmatrix} 4 & -2 \\ 2 & 0 \end{bmatrix} \text{ and } Q = \begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$$

Find  $(QP)^{-1}$  (5 marks)

- ii) What is identity matrix (I)? Show that  $AI = IA$  (3 marks)
- e) Find the Median wage of the employees provided (3 marks)

Wage (Ksh)	5000	10000	15000	20000
No. of employees	2	1	2	5

- f) After how many years should \$2000 be compounded at 12% p.a to realize \$5000 (3 marks)

**QUESTION TWO**

- a) A group of 180 tourists arrived from the UK and some of them visited three parks. Luckily each park was visited by equal number of tourists that is 70. The parks were N, A and T; 7 tourists visited all the three parks; 27 visited A and T, 8 visited N and T, while 16 visited N and A park respectively;
- Using a venn diagram, illustrate the above information. (3 marks)

ii) How many tourists did not visit any park? (5 marks)

b) There are two cartons in a procurement store. Carton A contains 5 HB pencils and 3H pencils while carton B contains 7 HB pencils and 2 H pencils. The procurement officer picks one carton at random. From the picked carton, he picks one pencil at random and gives it to the administrative assistant. He picks the second pencil from the same carton at random and gives it to the accountant.

i) Use a tree diagram to illustrate the above information. (3 marks)

ii) Find the probability that the two pencils picked by the procurement officer were of similar type (answer in 3 decimal places). (4 marks)

### QUESTION THREE

a) During market segmentation exercise, the marketing officer gathered the following data on the population of a small region.

Age	No. of persons
0 and less than 5	3
5 and less than 10	9
10 and less than 15	12
15 and less than 20	9
20 and less than 25	13
25 and less than 30	5
30 and over	2

i) Find the mean age of the population. (3 marks)

ii) Find the standard deviation of the population's age. (4 marks)

iii) Estimate the value of the mode hence the Pearson's measure of skewness. (5 marks)

- b) Simplify the equation given and use quadratic root formula to solve.

$$\frac{9}{x} + x = 6 \quad (3 \text{ marks})$$

#### QUESTION FOUR

- a) i) Find the nature of the turning point of the function  $y = x^3 - 8x^2 + 5x + 3$  (6 marks)

ii) Evaluate  $\int_0^1 (8x^3 - 3x^2 + 8x + 10) dx$  (3 marks)

- b) Kunt bought 10 trays of eggs and 5 bags of apples and hence paid a sum of ksh. 2000 on Monday. On Friday he bought 8 trays of eggs and 5 bags of apples hence paid Ksh. 200 less than the sum he paid on Monday. Form the equations involved in the given information and use Cramer's rule to solve the equations hence determine the cost of 20 trays of the same type of eggs. (6 marks)

#### QUESTION FIVE

- a) i) Explain any two application areas of index numbers in an economy. (2 marks)
- ii) From the data given below, calculate Laspeyres and Paasche price indices hence estimate Fisher's ideal index taking 2002 as the base year. (8 marks)

Item	2002		2010	
	Price	Quantity	Price	Quantity
Apple	65	20	135	30
Mangoes	95	8	160	7
Oranges	150	5	320	8

- b) \$5000 accrues to \$8500 after 6 years compounding rate at  $x\%$  p.a. Calculate the value of  $x$ . (5 marks).

**QUESTION SIX**

- a) A Sacco invests in some project estimated that after some period, the profit function will take the form  $y+2x^2=6x+10$ , where  $x$  represents the time in months.
- i) Draw a graph which represents the profit function within the range of  $x$  being between  $-2$  and  $+5$  (5 marks)
  - ii) Use your graph to estimate and state break-even points (3 marks)
  - iii) What would be the best time to stop investing more in the project? (2 marks)
- b) A school has tendered for two independent contracts. It is estimated that it has probability of  $0.5$  of obtaining contract A and probability of  $0.2$  in obtaining contract B. Find the probability that the school obtains
- i) Both contracts. (2 marks)
  - ii) Exactly one of the contracts. (3 marks)

# FORMULAE

1. Mean  $\bar{X} = \frac{\sum fX}{\sum f}$

2. Median =  $L + \left( \frac{\frac{N}{2} - F_{m-1}}{f_{mc}} \right) \times C$

3. Mode =  $L + \left( \frac{D1}{D1 + D2} \right) \times C$

4. Standard deviation =  $\sqrt{\frac{\sum fX^2}{\sum f} - \bar{X}^2}$

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

5. Coefficient of skewness =  $\frac{\text{mean} - \text{mode}}{\text{Standard deviation}}$

6. Laspeyres price index

$$L_p = \frac{\sum p_n q_o}{\sum p_o q_o} \times 100$$

7. Paasche price index

$$P_p = \frac{\sum p_n q_n}{\sum p_o q_n} \times 100$$

8. Fisher's Index

$$P_F = \sqrt{L_p \times P_p}$$

9.  $CV = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$

10.  $\bar{X}_C = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2}{N_1 + N_2}$

11. Simple interest;  
 $A = P(1 + in)$

12. Compound interest  
 $A = p(1+i)^n$